Health&Safety Manual

Supplement 21.20

Safe Handling of Lead and Lead Compounds in General Industry and Construction Operations

September 1995

Approved by the ES&H Working Group

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Safe Handling of Lead and Lead Compounds in General Industry and Construction Operations*

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in General Industry and Construction Operations

Section I. General Information

1.0 Introduction

1.1 Purpose and Scope

Lead, element number 82, is a gray metal with a mean atomic weight of 207.19. Lead forms many organic and inorganic compounds and a wide range of alloys. Lead has been used for thousands of years, and until recently was commonly found in a wide range of commercial and industrial products. Lead has been used as a pigment in paints, solder, surfacing for galvanized metal, as an additive in gasoline, and in alloys such as brass and pewter. At LLNL, lead has also been widely used in radiation shielding and as a reagent in laboratories.

This supplement outlines the requirements for work involving lead. The general information in this section applies to both General Industry Operations (Section II) and Construction Operations (Section III). General Industry Operations include research activities, the handling of lead shielding, building of experimental equipment, and machining of lead or lead alloys. Construction Operations include maintenance, the demolition or remodeling of buildings, new building construction, the removal of lead paint from equipment or buildings, and the use of paint that contains lead for road demarcation.

Appendix A contains terms and definitions used in this supplement; the other appendices contain requirements applicable to both Sections II and III.

All Laboratory employees, subcontractors, and supplemental labor employees must follow the procedures outlined in this supplement when performing lead work. Certain employees may perform work that falls under both Sections II and III. For example, an individual may be assigned to demolish a large piece of equipment coated with a lead-containing paint (Section II), and the task may require the disturbance of walls coated with a leaded paint or roofing sheets made of lead-galvanized metal (Section III). In many cases, there may seem to be only little differences between the two sections. But it is important for each employee to fully understand which set of requirements applies to each aspect of the particular job.

1.2 Health Effects

Lead is a potentially serious occupational health hazard. Lead and most lead compounds are toxic by inhalation or ingestion of dust. A few lead compounds are considered possible carcinogens (lead acetate, lead chromate, lead phosphate and lead subacetate). Volatile organic lead compounds may generate vapors that are toxic when inhaled. Liquid organic lead compounds may be absorbed through the skin, and some organic and inorganic lead compounds may directly irritate the skin.

Lead is a teratogen that can cause fetal malformation, a mutagen that can affect both sperm and eggs, and a reproductive toxin that can impair fertility. Acute, high-level poisoning with lead can lead to encephalopathy with seizures, coma, and, in severe cases, death. In many cases, the effects of lead poisoning are irreversible (or only partially reversible) and can lead to permanent impairment of the function of the brain, kidney, nervous system, or reproductive system. More chronic exposure can lead to qualitatively similar effects, including damage to blood-forming organs, the nervous system, urinary tract, digestive tract, and reproductive system. Chronic exposure to relatively low levels of lead may cause neurological and neurobehavioral problems, especially in children. These effects may not be fully reversible if the exposure has been ongoing for a long time, or if it occurs during critical developmental phases.

Section II. General Industry Operations

2.0 Requirements and Procedures for Compliance and Risk Reduction

The requirements in this section are applicable *only* to General Industry Operations (e.g., machining lead-containing materials, moving lead bricks, and soldering with lead-containing alloys in Programmatic shops). These requirements are not applicable to construction activities, including building maintenance activities, or to the handling of lead compounds in chemistry research laboratories. See Section III for the requirements for construction activities that involve the handling of lead or lead compounds. Controls for research laboratories can be found in Supplement 21.16A (Safe Handling of Chemical Carcinogens in Research Laboratories) and Supplement 21.01 (Chemical Hygiene Plan for Laboratories).

2.1 Requirements/Regulatory Summary

The guidance and requirements in this section are based on the following:

- 29 CFR 1910.1025, "General Industry Lead Standard." This standard applies to elemental lead, all inorganic lead compounds, and lead soaps. It does not apply to other organic lead compounds.
- 29 CFR 1926.62, "Construction Industry Lead Standard." Parts of the medical surveillance provisions of this standard that are more conservative than those found in 29 CFR 1910.1025 are adopted for use in this section.
- 29 CFR 1910.1000, "Air Contaminants." This regulation specifies exposure limits for tetraethyl lead and tetramethyl lead.
- Department of Housing and Urban Development "Guidelines for the evaluation and control of lead-based paint hazards in housing."[1] Guidelines for certain aspects of lead work are referenced from this publication.
- Limits for lead in paint established by the Stewart B. McKinney Homeless Amendments Act to the Lead-Based Paint Poisoning Prevention Act, PL-100-628. These limits are used as an administrative guideline.
- The Biological Exposure Index for Lead, as established by the American Conference of Governmental Industrial Hygienists.[2]

2.2 Procedures for Risk Reduction

2.2.1 Lead Exposure limits

Airborne Limits. The permissible exposure limit (PEL) for metallic lead, any inorganic lead compound, or lead soaps is 50 $\mu g / m^3$ of air averaged over an 8-hour period. The corresponding PEL for tetramethyl and tetraethyl lead is 75 $\mu g / m^3$ of air. There is no PEL for other organic lead compounds.

The medical surveillance action level for metallic lead, any inorganic lead compound, or lead soaps (for people who are or may be reasonably expected to be exposed for more than 30 days a year) is 30 $\mu g / m^3$ of air averaged over an 8-hour period. There is no action level for tetramethyl or tetraethyl lead or other organic lead compounds.

A negative exposure assessment (NEA) is a statement written or approved by an LLNL industrial hygienist indicating that a specific lead-disturbing job (or a class of very similar lead-disturbing jobs) does not result in employee exposure above the action level. Work conducted pursuant to an NEA can proceed without subsequent review, provided that the controls specified in the NEA are adhered to.

Blood Limits (Biological Monitoring). A biological monitoring program limits blood lead levels. See Appendix B, "Medical Surveillance Requirements," for details.

Surface Contamination Limits. When lead-containing materials are disturbed such that airborne dust is generated, residual surface contamination may pose a hazard to people who subsequently occupy the area. In such cases, surface sampling is conducted periodically as determined by the cognizant industrial hygienist. This is intended to verify the adequacy of housekeeping (see the section entitled "Housekeeping and Decontamination" in Section 2.2.3). The recommended limit for surface contamination in these areas is 100 $\mu g / ft^2$ (HUD limit).[1] A higher limit may be acceptable in areas where employees regularly use respiratory protection and other appropriate personal protective equipment, at the discretion of the cognizant industrial hygienist.

2.2.2 Monitoring Program

Personal Monitoring Program. Personal air sampling is conducted to assess an individual's (or group's) exposure to airborne lead during work that disturbs lead-containing materials. Initial samples are required for all operations where exposure above the action level may occur. The frequency of subsequent sampling is dependent upon the results of the initial samples.

The process for initiating and collecting air samples is as follows:

- Supervisors shall notify the cognizant industrial hygienist at least 48 hours in advance of planned lead operations so that air sampling can be arranged.

- The cognizant industrial hygienist or a health and safety technician working under the guidance of an industrial hygienist shall do the following:
  - — Collect the initial personal air samples for uncharacterized operations that may generate airborne lead and submit them to the Hazards Control laboratory for analysis.

    If the results of the representative samples are below the action level, no further sampling is required as long as the operation continues unchanged. If the results are above the action level but below the PEL, air sampling must be repeated at least every 6 months. For results greater than the PEL, air sampling must be repeated every 3 months and a written compliance plan (e.g., a Lead Work Permit [see Appendix C] or an operational safety procedure [OSP]) detailing the steps to be taken to reduce the airborne lead levels must be developed and implemented.

  - — Inform the supervisors of affected employees in writing within 5 work days if the samples show that exposure exceeds the PEL. Supervisors are then responsible for notifying each affected employee. Exposure results are reported without any consideration of respiratory protection worn during the operation. Provide these supervisors with a description of the corrective actions to be taken to reduce exposure, and the Health Services Department with a copy of the notification.

The results of air sampling conducted to measure exposure during operations at the Laboratory may be used to represent the level of exposure for other similar operations. The decision to accept these results, however, is at the discretion of the cognizant industrial hygienist.

Surface Monitoring. Samples should be obtained at least semiannually from areas where activities such as those described in Section 2.2.3 (Lead Work Permits) are conducted or where exposure above the action level may occur. The health and safety technician or industrial hygienist shall obtain these samples by making two S-shaped swipes with a prewetted wipe at a 90° angle over a 1-ft^2 area and submit the swipes to the Hazards Control laboratory for analysis. Details on this sampling method can be found in Section 10 (Requirements / Regulatory Summary) of the HUD Guidelines.[1]

Laboratories that analyze lead swipes or bulk samples must be accredited by the American Industrial Hygiene Association or another organization accredited by the Environmental Protection Agency (EPA) specifically to perform lead analysis.

Medical Surveillance and Removal

Applicability. The biological monitoring, medical surveillance, and removal provisions in this supplement are applicable to all LLNL and non-LLNL employees who are exposed to the limits described in this supplement. The

LLNL Health Services Department performs medical surveillance for LLNL employees only. The employers of non-LLNL employees provide medical surveillance for their employees.

The requirements below, including the general requirements detailed in Appendix B, apply to biological monitoring and medical surveillance.

1. For every employee who is (or may be) exposed to lead above the action level for 30 days or more a year, the supervisor will provide Health Services the number of days of exposure.
2. 29 CFR 1926.62 expresses the blood lead concentration in terms of micrograms of lead per deciliter (μg/dl) of blood, whereas 29 CFR 1910.1025 uses the roughly equivalent unit of micrograms of lead per 100 grams (μg/100 g) of whole blood. For the sake of consistency, this supplement uses micrograms of lead per deciliter of whole blood.
3. Biological monitoring includes the measurement of blood levels of zinc protoporphyrin (ZPP). The interpretation of ZPP results is within the discretion of the examining clinician.
4. Where required, a comprehensive physical exam must comply with the requirements of 29 CFR 1926.62(j)(3)(ii)(A-F).
5. Employees who are under work restriction because of an elevated blood lead level may request a second examination. Generally, the employees' Program or Department will cover the expenses of this examination, provided that these employees notify Health Services and their supervisors within 15 days of making an appointment with a physician of their choice. Any differences between the findings of two examining physicians shall be resolved in accordance with 29 CFR 1910.1025(j)(iii). Additional requirements relating to the temporary removal of employees from lead work areas can be found in 29 CFR 1910.1025(k).
6. Pregnant women, and women and men who are actively trying to conceive a child are urged to contact Health Services for a medical review. If the employee has been exposed to lead above the action level, Health Services will follow the rules in Table B-1 and Fig. B-1 of Appendix B. If the employee has not been exposed above the action level, Health Services will provide appropriate counseling and take the necessary action based upon the individual circumstances of the case.

2.2.3 Exposure Controls

Three types of controls are used to mitigate exposure to lead: engineering controls, administrative controls, and personal protective equipment. Of these, engineering controls are the preferred method.

Where employees are exposed above the PEL for 30 days or more a year, both engineering and administrative controls shall be used to reduce exposure to or below the PEL. If these controls are not adequate, respiratory protection shall be

used in addition to engineering and administrative controls. Where employees are exposed above the PEL for more than 30 days a year, engineering controls must be used to reduce exposure to levels close to the PEL but at least to 200 $\mu g / m^3$. In addition, any combination of controls can be used to further reduce exposure to the PEL (50 $\mu g / m^3$).

Engineering Controls. Ventilation systems used to control lead aerosols must be evaluated qualitatively or quantitatively every 6 months. These systems must be re-evaluated within 5 days of a process or ventilation change that may alter employee exposure. Ventilation systems used for unique, temporary, or infrequent lead operations shall be evaluated before use. The nature of these evaluations shall be determined by the cognizant industrial hygienist. At a minimum, quantitative evaluation shall be conducted annually. (NOTE: This requirement applies only to elemental lead, inorganic lead compounds, and lead soaps.)

Where they will not interfere with their shielding properties, lead items used for shielding or weighting should be encapsulated in a suitable coating to protect the lead from corrosion and to reduce employee contact. Corroded lead materials may be particularly hazardous and should be encapsulated or replaced if feasible. Newly purchased shielding bricks should be encapsulated to prevent corrosion.

Administrative Controls

Lead Work Permits. Permits are used for short-term operations and must be developed for any operation that will result (or may be reasonably expected to result) in exposure above the PEL, unless the operation is described in a current safety procedure or a current NEA. Permits must specify the manner in which the work will be altered to reduce exposure level to the PEL using both engineering and administrative controls.

The responsible supervisor must develop a Lead Work Permit for the following activities:

- Machining of lead or alloys with more than 0.06% of lead.
- Sanding of lead, lead coatings, or lead alloys with more than 0.06% lead.
- Burning, welding, or torch brazing of any material containing or coated with any amount of lead.
- Abrasive blasting of any material containing or coated with any amount of lead.
- Handling of 25 or more lead bricks, unless the bricks are encapsulated.
- Handling of more than 25 lb of lead shot or beads, unless they are fully encapsulated.
- Spray paints or coatings containing more than 0.06% lead.

- Volatile organic lead compounds used other than as a reagent in chemistry laboratories.
- All operations that may result in exposure over the PEL.
- Use of any lead compound identified as a potential carcinogen.

The supervisor shall submit the permit to the cognizant industrial hygienist for approval at least 48 hours in advance of beginning the scheduled work.

Lead-disturbing activities that are smaller in scope than those listed above (e.g., handling of <25 lead bricks) are designated as "minuscule lead work." It is assumed that this type of work will not result in exposure above the PEL. A Lead Work Permit is not required for minuscule lead work; however, lead awareness training is required for personnel performing the work.

It should be noted that the exemption for minuscule lead work is based on best industrial hygiene judgment, and that there may be unusual circumstances under which the work may result in hazardous levels of airborne lead. This exemption is not applicable where lead compounds determined to be possible carcinogens are disturbed or used.

Safety Procedures. OSPs may be used in lieu of Lead Work Permits. An OSP is appropriate where lead work is ongoing or repetitive and may be reasonably expected to result in exposure above the PEL. Operations adequately covered in an OSP do not require a Lead Work Permit. The cognizant industrial hygienist will determine if an OSP is adequate or if a supplemental Lead Work Permit is required. Lead OSPs must be reviewed *every* 6 months.

Housekeeping and Decontamination. These are important elements in the control of lead exposure. Dry sweeping and blowing of lead-containing dusts are prohibited. Contaminated work surfaces should be cleaned sufficiently to reduce lead levels to less than 100 $\mu g / ft^2$. A higher level may be accepted for industrial areas, at the discretion of the cognizant Hazards Control industrial hygienist. Recommended clean-up methods include vacuuming the area with a HEPA-filtered vacuum or wet-wiping with disposable cloths. Consult the cognizant environmental analyst for guidance on the proper waste disposal practices.

Personal Hygienic Practices. The precautions below apply to areas where lead is disturbed, unless the work is covered by an NEA or is minuscule work.

- Designate a separate location for eating, storing, and preparing food and beverages, and for using tobacco products and cosmetics to avoid the possibility of ingesting lead. *No lead work shall be performed in these designated areas.*
- Wash your hands and face before eating, drinking, using tobacco products, or applying cosmetics.
- Designate change rooms where employees can segregate street clothes from clothing used for work.

- Provide shower facilities. Showers located throughout the Laboratory may be used, provided that other employees do not use these showers while they may be potentially contaminated with lead dust. Showers used for lead work must be decontaminated before use by other employees. Portable shower units may be used for required decontamination activities.

Signs. Signs with the wording below shall be posted at all possible entrances to areas where lead work (other than minuscule lead work or work performed pursuant to an NEA) is being conducted. These signs shall be well illuminated so that they are easily visible to employees and visitors. Contact your ES&H team for guidance if you have any questions about signs.

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

Personal Protective Equipment. Personal protective equipment such as coveralls, shoe covers, head covers, gloves, and respirators are required for operations that may generate airborne lead levels above the PEL (50 $\mu g / m^3$) and operations that require a Lead Work Permit for which there is no NEA. Safety shoes will be required for many operations. Leather gloves (or equivalent) shall be used when handling unencapsulated lead bricks or shielding. Additional requirements may be applicable if the exposure is known or expected to exceed 200 $\mu g / m^3$. Where required, such equipment shall be specified in an OSP, Lead Work Permit, or on a Hazard Assessment Form that has been reviewed and approved by the cognizant industrial hygienist.

Respirators shall be selected by a Hazards Control industrial hygienist in conformance with LLNL's and OSHA's requirements. No employee shall be required to wear a negative pressure respirator for more than 4.4 hours a day during the installation of feasible engineering controls. Fit-testing of negative pressure respirators must be conducted within 6 months prior to lead work. If requested by the employee, a powered air-purifying respirator must be provided in lieu of a negative pressure respirator.

2.3 Responsibilities

2.3.1 Hazards Control Department

The Hazards Control Department shall

- where possible, establish NEAs for consistent types of lead work;
- perform required air monitoring;
- notify supervisors of air sample results;

- notify supervisors of the need for medical surveillance when sampling so indicates;
- assist in the design and implementation of engineering control systems;
- provide the necessary training or assist in identifying an alternative source of training;
- provide exposure information to the Health Services Department.
- review OSPs or Lead Work Permits to ensure they incorporate adequate controls;
- select the most appropriate type of respirator for employees involved in lead work;
- provide respirators to qualified personnel;
- assist supervisors in identifying potential lead-disturbing activities; and
- perform surface swipe testing as required.

2.3.2 Health Services Department

The Health Services Department shall

- perform required medical surveillance exams and blood tests;
- determine when employees must be removed from exposure because of abnormalities detected during medical surveillance;
- determine when employees who are removed from work involving lead because of medical abnormalities can return;
- notify employees of any medical findings, as required;
- contact Hazards Control and request a worksite evaluation for any employee found to have a blood-lead level above that specified in Section 2.2.1; and
- determine if measured elevations in blood lead are occupational.

2.3.3 Safeguards and Security

Safeguards and Security shall

- ensure that all firing range instructors have a blood lead test at least every 6 months; and
- provide engineering and administrative controls that maintain exposure below the action level for firing range instructors and other persons on the firing line or in the immediate area.

2.3.4 Supervisors

Supervisors shall identify all employees who may be reasonably expected to be exposed to lead. In addition, they shall

- request that the ES&H team evaluates the workplaces of all employees who may be exposed to lead above established limits;

- schedule employees who are exposed above the medical surveillance action level for medical exams;
- ensure that all available and specified engineered and administrative controls and personal protective equipment are used appropriately;
- ensure that individuals who may be potentially exposed to lead receive appropriate training;
- initiate Lead Work Permits or OSPs when required;
- notify employees of the results of personal air samples;
- conduct lead awareness training;
- provide an alternate workplace and job for employees who Health Services has removed from work involving lead exposure; and
- notify the industrial hygienist at least 48 hours prior to lead work, as required.

2.3.5 Employees

All employees shall follow the requirements outlined in this supplement for work involving lead. In addition, any employee who is pregnant or actively trying to conceive a child should notify the Health Services Department.

2.4 Training

2.4.1 OSHA-Required Training

29 CFR 1910.1200 (Hazard Communication Standard), 29 CFR 1910.1450 (Laboratory Hazards Standard), 29 CFR 1910.1025 (General Industry Lead Standard), and several other OSHA regulations require training for lead hazards. 29 CFR 1910.1025 stipulates two levels of training.

Level 1. 29 CFR 1910.1025 states that employees who are occupationally exposed to lead at *any* level above background must be informed of the content of the standard and its appendices. A short, job-specific training session (lead awareness training) is appropriate to fulfill this requirement. In this training, employees should be provided a copy of the standard and its appendices and the task-specific aspects of the operation should be addressed (e.g., expected degree of hazard, health effects, good practices, personal hygiene, and sources of additional information). Lead awareness training fulfills part of the requirement of the Health Hazard Communication Standard (see Supplement 7.02).

Level 2. Lead worker training is required annually for employees who may be reasonably expected to be exposed at or above the action level or for whom the possibility of skin irritation exists. Lead worker training consists of a review of

elements of the lead standard (29 CFR 1910.1025) in more detail. These elements include the following:

- The content of the lead standard and its appendices. Copies of this standard must be given to employees.
- The specific nature of the operation that could result in exposure above the action level.
- Respirator-use training, as outlined in 29 CFR 1910.134.
- A description of the Medical Surveillance Program, the procedure for removing affected employees from work involving lead, and information on the adverse health effects of lead. Particular emphasis is placed on the male and female reproductive systems.
- A description of engineering and administrative controls and personal protective equipment.
- The content of any compliance plans, including information on the proper uses of chelating agents.

2.4.2 Other Training

The Hazards Control Department does not routinely offer lead training because exposure above the action level in General Industry Operations is expected to be rare at LLNL. However, supervisors are responsible for ensuring that employees receive training appropriate to their job functions. The cognizant ES&H team arranges for appropriate lead training, and the cognizant industrial hygienist determines the length and content of the training material. Special classes can be provided by the cognizant industrial hygienist.

All completed training shall be submitted to the Laboratory Repository of Completed Courses (LROCC).

Section III. Construction Operations

3.0 Requirements and Procedures for Compliance and Risk Reduction

This section is applicable to construction-type activities that involve the handling of lead or lead compounds, including demolition, renovation, new construction, lead abatement, and maintenance activities. Non-construction activities are addressed in Section II of this supplement. Research laboratory activities involving lead are addressed in Supplement 21.16A (Safe Handling of Chemical Carcinogen in Research Laboratories) and Supplement 21.01 (Chemical Hygiene Plan for Laboratories).

3.1 Requirements/Regulatory Summary

The guidance and requirements in this section are based on the following:

- 29 CFR 1926.62, "Construction Industry Lead Standard." This standard applies to elemental lead, inorganic lead compounds, and lead soaps. It does not apply to other organic lead compounds.
- 29 CFR 1910.1000, "Air Contaminants." This regulation specifies exposure limits for tetraethyl lead and tetramethyl lead.
- Department of Housing and Urban Development, "Guidelines for the evaluation and control of lead based paint hazards in housing."[1] Guidelines for certain aspects of lead work are referenced from this publication.
- Limits for lead in paint established by the Stewart B. McKinney Homeless Amendments Act to the Lead-Based Paint Poisoning Prevention Act, PL-100-628. These limits are used as an administrative guideline.
- California Code of Regulations, Title 17, Division 1, Chapter 8, "Accreditation of Training Providers and Interim Certification of Individuals Engaged in Lead-related Construction Work." Accreditation requirements are referenced from this publication. The California licensing requirements current and in effect are applicable.
- The Biological Exposure Index for Lead, as established by the ACGIH.[3]

3.2 Procedures for Risk Reduction

3.2.1 Lead Exposure limits

Airborne Limits. The permissible exposure limit for metallic lead, any inorganic lead compound, or lead soaps is 50 $\mu g / m^3$ of air averaged over an 8-hour period.

The corresponding PEL for tetramethyl and tetraethyl lead is 75 $\mu g / m^3$ of air. There is no PEL or TLV for other organic lead compounds.

The medical surveillance action level for metallic lead, any inorganic lead compounds, or lead soaps is 30 $\mu g / m^3$ of air averaged over an 8-hour period. There is no action level for tetramethyl or tetraethyl lead or other organic lead compounds.

A negative exposure assessment (NEA) is a statement written and approved by an LLNL industrial hygienist indicating that a specific lead-disturbing job (or a class of very similar lead-disturbing jobs) does not result in employee exposure above the action level. Work conducted pursuant to an NEA can proceed without subsequent review, provided that the controls specified in the NEA are adhered to. If a change in process, equipment, material, personnel, or task result in a different lead exposure, the NEA may not be applicable.

Blood Limits (Biological Monitoring). A biological monitoring program limits blood lead levels. See Appendix B, "Medical Surveillance Requirements," for details.

Surface Contamination Limits. When lead-containing materials are disturbed such that an aerosol is generated, residual surface contamination may pose a hazard to people who subsequently occupy that area. In such cases, surface sampling is conducted at the end of the lead activity. This is intended to verify the adequacy of decontamination procedures. The maximum recommended permissible surface contamination level is 100 $\mu g / ft^2$ for general-occupancy areas. Higher values may be acceptable for industrial areas, at the discretion of the industrial hygienist.

3.2.2 Monitoring Program

Preconstruction Paint Sampling. Lead is present in paint on the surfaces of many LLNL buildings. Thus, it is necessary to identify maintenance, renovation, remodeling, and demolition activities that will disturb lead-coated surfaces so that the appropriate controls can be implemented before work begins. Until a survey of LLNL structures is conducted, it will be necessary to test the interior and exterior of most building surfaces before beginning activities that disturb potential lead-containing material. Alternatively, it may be assumed that the material disturbed includes lead. If it is known that the building was constructed after 1979 and paints containing lead at concentrations above 0.06% were not used, testing is not required. However, it is generally not possible to make this determination with certainty. The supervisor of the persons performing the work should exercise this option only if he/she knows for sure that lead-containing paints were not used at any time on the surface to be disturbed.

Specifically, painted surfaces must be tested before beginning construction activities that involve

- scraping, abrasive blasting, or sanding;

- demolishing buildings;
- cutting, sawing, or otherwise penetrating a wall or other painted surface;
- burning, torch cutting, arc cutting, welding, brazing;
- using a heat gun to remove paint; or
- performing other activities that generate lead-containing dust.

Testing also must be conducted on other potential lead-containing construction materials that will be disturbed such that a lead aerosol may be generated, including but not limited to

- galvanized metal that is to be cut with a torch, burned, or otherwise heated to the melting point of lead (>320°C);
- brass, bronze, and pewter that is to be sanded or heated to the melting point of lead (>320°C); and
- solders that are to be sanded.

Testing and Analysis Techniques. Testing can utilize bulk-sampling, with subsequent analysis conducted using atomic absorption or inductively coupled plasma emission spectroscopy (ICPES) or a portable x-ray fluorescence lead detector. Alternative techniques (e.g., laboratory x-ray fluorescence) may be approved by the cognizant industrial hygienist.

A paint is generally determined to be lead-containing if the bulk sample analysis indicates it has more than 600 parts per million (ppm) of lead. Portable x-ray fluorescence equipment measures lead in terms of units of milligrams of lead per square centimeter of surface—not in ppm. These units are not readily interconvertable. Further, at this time, portable equipment usually is not sensitive to lead in paints at levels of 600 ppm. Negative findings using portable x-ray fluorescence equipment must generally be confirmed by laboratory analysis; however, it is permissible to accept positive results obtained with this equipment.

Laboratories that analyze lead swipe or bulk samples must be accredited by the American Industrial Hygiene Association or another organization accredited by the EPA specifically to perform lead analysis.

Work Performed by Plant Engineering Personnel. Preconstruction testing is conducted by Plant Engineering personnel who must (1) complete the State Accreditation Program for Lead Inspectors or be certified by the American Board of Industrial Hygiene in Comprehensive Practice of Industrial Hygiene, or (2) work under the direct supervision of a Certified Industrial Hygienist or an accredited inspector.

Work Performed by Subcontractors. Plant Engineering personnel shall either (1) test all potentially lead-containing surfaces before releasing a construction proposal for work that may disrupt lead, or (2) require the contractor to perform the sampling before disrupting any potential lead-containing materials. Contractors

who make lead determinations must be accredited by the State of California as lead building inspectors or lead technicians or the work must be conducted *directly* by a Certified Industrial Hygienist.

Work Performed by Other LLNL Organizations. Programs shall ensure that testing is performed by or under the supervision of the ES&H team.

Personal Air Sampling. Personal air samples are collected to characterize an individual's (or group's) exposure to lead. Initial and periodic sampling may be required, depending on the nature of the work and the exposure level. Every construction-related procedure (other than minuscule lead work) that will disturb lead should have personal sampling until an NEA is established.

Following is the general procedure for personal air sampling:

- Supervisors shall notify the cognizant industrial hygienist at least 48 hours in advance of planned lead operations so that air sampling can be arranged.
- The cognizant industrial hygienist or a health and safety technician working under the guidance of an industrial hygienist shall then do the following:
  - Collect the initial air samples for uncharacterized operations that may generate airborne lead and submit them to the Hazards Control laboratory (or other laboratory) for analysis.

    If the results of these representative samples are below the action level, no further sampling is required if the operation continues unchanged. A change in equipment, process, personnel, or task must be evaluated by the cognizant industrial hygienist to determine if further sampling is required. If the results are above the action level but below the PEL, air sampling must be repeated at least every 6 months. For results greater than the PEL, air sampling must be repeated every 3 months. In addition, a written compliance plan (e.g., Lead Work Permit or an OSP) detailing the steps to be taken to reduce airborne lead levels must be developed and implemented.
  - Inform the supervisors of affected employees in writing within 5 work days if exposure exceeds the PEL. Supervisors are then responsible for notifying each affected employee. Exposure results are reported without any consideration of respiratory protection worn during the operation. Provide these supervisors a with description of the corrective actions to be taken to reduce exposure, and the Health Services Department with a copy of the notification.

The results of air sampling conducted to measure exposure during operations at the Laboratory may be used to represent the level of exposure for other similar operations. The decision to accept these results, however, is at the discretion of the cognizant industrial hygienist.

Surface Contamination Sampling. The floors and other surfaces in construction work areas where lead is disturbed should be tested for residual lead contamination before LLNL employees can re-occupy those areas. Specifically, this requirement applies when the work involves any of the activities listed in the section entitled "Lead Work Permits" (in Section 3.2.3) for which there is no NEA, when the work is lead hazard abatement or involves exposure above the action level, and when the work area is inside and will subsequently be re-occupied on a regular basis.

These samples are obtained by making two S-shaped swipes with a prewetted wipe at a 90° angle over a 1-ft^2 area and submitting the swipes to the Hazards Control laboratory for analysis. Details on this sampling method can be found in Section 10 (Requirements/Regulatory Summary) of the HUD Guidelines.[1]

Clearance swipe samples for work performed by subcontractors shall be obtained and analyzed by the subcontractor in accordance with the HUD Guidelines.[1] However, LLNL reserves the right to request changes in the sampling and analysis procedure or to obtain parallel clearance samples.

The analytical laboratory the subcontractor uses must be accredited by the American Industrial Hygiene Association or another organization accredited by the EPA specifically to perform lead analyses.

Medical Surveillance and Removal

Applicability. The biological monitoring, medical surveillance, and removal provisions in this supplement are applicable to all LLNL employees, supplemental labor employees, and subcontractors who are exposed above the limits specified in this supplement.

The LLNL Health Services Department performs medical surveillance for LLNL employees only, and the employers of non-LLNL employees provide medical surveillance to their employees.

The requirements below, including the general requirements detailed in Appendix B, apply to biological monitoring and medical surveillance.

1. For every employee who is (or may be) reasonably expected to be exposed to lead above the action level for one or more days, or who performs tasks that require a Lead Work Permit or lead OSP, the supervisor will provide Health Services the number of days of exposure.

2. 29 CFR 1926.62 expresses the blood lead concentration in terms of micrograms of lead per deciliter (µg/dl) of blood, whereas 29 CFR 1910.1025 uses the roughly equivalent unit of micrograms of lead per 100 grams (µg/100 g) of whole blood. For the sake of consistency, this supplement uses micrograms of lead per deciliter of whole blood.

3. Biological monitoring includes the measurement of blood levels of zinc protoporphyrin (ZPP). The interpretation of ZPP results is within the discretion of the examining clinician.

4. Where required, a comprehensive physical exam must comply with the requirements of 29 CFR 1926.62(j)(3)(ii)(A-F).

5. Employees who are under work restriction because of an elevated blood lead level may request a second examination. Generally, the employees' Program or Department will cover the expenses of this examination, provided that these employees notify Health Services and their supervisors within 15 days of making an appointment with a physician of their choice. Any differences between the findings of two examining physicians shall be resolved in accordance with 29 CFR 1926.62. Additional requirements relating to the temporary removal of employees from lead work areas can be found in 29 CFR 1926.62.

6. Pregnant women, and women and men who are actively trying to conceive a child are urged to contact Health Services for a medical review. If the employee has been exposed to lead above the action level, Health Services will follow the rules in Table B-1 and Fig. B-1 of Appendix B. If the employee has not been exposed to lead above the action level, Health Services will provide appropriate counseling and take the necessary action based upon the individual circumstances of the case.

All LLNL construction subcontracts, including labor only, supplemental labor, and job-specific contracts, must have a provision excluding the use of prophylactic chelation therapy at any time where there is a possibility that employees may be exposed to lead above the action level.

3.2.3 Exposure Controls

Three types of controls are used to mitigate exposure to lead: engineering controls, administrative controls, and personal protective equipment. Of these, engineering controls are the most preferred method. Both engineering and administrative controls shall be used to reduce employee exposure to or below the PEL, or as close to the PEL as is feasible.

Engineering Controls. Lead work that is known to result in exposure above the PEL, or activities such as those that require a Lead Work Permit or safety procedure (see the section entitled "Administrative Controls"), will typically require the following engineering and administrative controls:

- Use of HEPA-filtered exhaust systems at the source of aerosol generation or, if this is not feasible, within the general work area.
- Establishment of a regulated area that will keep unprotected employees out and prevent the spread of lead dust beyond the boundaries of the area. For work inside buildings, this will involve erection of critical

barriers over ventilation system vents, doors, open areas, and other penetrations. Further, it may be necessary to arrange the ventilation system to place the work area under negative pressure relative to the surrounding areas. The cognizant industrial hygienist shall specify the necessary controls.

- Use of exhausted power tools with HEPA filters.
- Use of wet methods.

Administrative Controls

Lead Work Permits. Permits are used for short-term operations and must be developed for any operation that may result in exposure above the PEL, unless the operation is described in a current safety procedure or a current NEA. Permits must specify the manner in which the work will be altered to reduce exposure level to the PEL using both engineering and administrative controls.

A Lead Work Permit (Appendix C) is required for the following activities where lead-containing paint or other lead sources can be disturbed:

- Demolishing buildings; scraping and sanding paint; using a heat gun; spray-painting; cleaning power tools with a HEPA-filtered dust-collection system; or other similar processes where the material contains more than 0.06% lead. (Exposure of 10 times the PEL for these operations shall be assumed unless data indicate otherwise.)
- Using leaded mortar; lead burning; rivet busting; cleaning power tools without a HEPA-filtered, dust-collection system; using dry expendable abrasives for clean-up activities; and moving or removing abrasive blasting enclosure where the material contains 0.06% lead. (Exposure of 25 times the PEL shall be assumed for these operations unless data indicate otherwise.)
- Performing activities where leaded paints, leaded coatings or lead-containing alloys are disturbed by abrasive blasting, welding, cutting and torch burning where the material contains *any* lead. (Exposure of 50 times the PEL shall be assumed for these operations unless other data indicate otherwise.)
- Performing other operations that may result in exposure above the PEL.
- Performing lead abatement work.

Until an NEA is developed for each of these tasks, employees shall be provided with suitable respiratory protection, protective clothing, change areas, hand-washing facilities, biological monitoring, and training.

No Lead Work Permit is required for minuscule work involving potentially lead-coated surfaces as long as the work is conducted by employees who have had lead awareness training (see Section 3.4) and the procedures specified in that training are used. Minuscule work is defined as

- the disturbance of paint containing less than 0.06% lead, except processes or activities that heat the material to near the boiling point of lead;
- the drilling of no more than 12 holes per room (or area) that are less than 1/2 in. in diameter;
- the removal of no more than 12 screws per room (or area);
- the installation of no more than 12 screws per room (or area) smaller than 1/2 in. in diameter; and
- the installation of no more than 12 nails (per room or area), up to 2 in.

It should be noted that exemptions for minuscule lead work are based on best industrial hygiene judgment, and that there may be unusual circumstances under which this type of work may result in hazardous levels of airborne lead.

Safety Procedures. Activities involving more than 40-person hours should be described in a safety procedure, rather than on a Lead Work Permit, unless the cognizant industrial hygienist determines that a Lead Work Permit would be adequate and waives the safety procedure requirement. Operations adequately covered in a safety procedure are not required to be described in a Lead Work Permit. The cognizant industrial hygienist shall determine if the work is adequately addressed in a safety procedure or if a supplemental Lead Work Permit is required.

Subcontract Work. Lead work conducted by subcontractors (other than supplemental labor) requires prior submission of either an NEA pursuant to 29 CFR 1926.62(d)(3) that is satisfactory to the cognizant industrial hygienist or a Lead Compliance Program that incorporates all the elements specified in 29 CFR 1926.62(e). Contractors also are required to perform lead-disrupting work in accordance with Plant Engineering specifications and the guidance given in this supplement. Use of a Lead Work Permit will not meet this requirement. The Lead Compliance Program or an NEA shall be submitted to the cognizant industrial hygienist for approval before beginning work that disturbs lead.

Personal Hygienic Practices. The precautions below apply to areas where lead and lead compounds are used; they do not apply to minuscule lead work or work addressed in an NEA.

- Designate separate lunch rooms, food storage and preparation areas, and eating areas to avoid the possibility of ingesting lead. *No lead work shall be performed in these designated areas.*
- Wash your hands and face before eating, drinking, using tobacco products, or applying cosmetics.
- Designate change rooms where employees can segregate street clothes from clothing used for lead work operations that generate airborne lead levels exceeding the PEL.

- Have shower facilities in the area if the airborne levels are greater than the PEL and for operations in the section entitled “Lead Work Permits” for which there is no NEA. Showers located throughout the Laboratory may be used for these purposes, provided that other employees do not use the showers while they are potentially contaminated with lead dust. Showers used for lead work must be decontaminated before they can be used by other Laboratory employees. Portable shower units may be used for required decontamination activities.
- Make sure that surfaces are free of any accumulation of lead dust. Use HEPA-filtered vacuum cleaners to remove dust and debris. Dry shoveling and sweeping are prohibited.
- Promptly place lead-coated or lead-containing demolition or renovation debris (e.g., sheet rock) in plastic bags or other sealable containers. Do not allow them to accumulate in the workspace.

Signs. Signs with the wording below shall be posted at all possible entrances to areas where lead work (other than minuscule lead work) is being conducted and for which there is no NEA. These signs shall be well illuminated so that they are easily visible to employees and visitors. Contact your ES&H team for guidance if you have any questions about signs.

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

Personal Protective Equipment. Personal protective equipment includes disposable coveralls, gloves, head covers, work shoes with disposable covers, respirators, and other necessary equipment. Such equipment is required for operations that generate airborne lead levels above the PEL ($50\ \mu g / m^3$) or for activities for which there is no NEA and a Lead Work Permit or safety procedure is required.

Employees may be issued reusable work coveralls in lieu of disposable coveralls. These coveralls shall not be worn home as an alternative to disposable coveralls. Coveralls shall be laundered by LLNL (or the subcontractor for subcontracted work) and provided to employees at least weekly, or daily, if exposure levels exceed $200\ \mu g / m^3$. Reusable clothing must comply with the requirements in 29 CFR 1926.62(g)(2).

Respirators shall be selected by a Hazards Control industrial hygienist in conformance with LLNL and OSHA requirements. Fit-testing for respirators must be conducted within 6 months prior to lead work. If requested by the employee, a powered air-purifying respirator must be provided in lieu of a negative pressure respirator.

3.2.4 Application and Installation of Lead-Containing Products

With the exception of the use of leaded solder in electrical work, materials containing more than 0.06% lead shall not be used, specified, or allowed in the construction of buildings or infrastructure. In addition, paint shall not contain more than 0.06% lead, and solder used in potable water distribution systems must not contain lead. An exception to this requirement is allowed where the user (or specifier) can demonstrate that no adequate non-leaded replacement product is available. The use of leaded construction materials in such cases requires prior approval of the cognizant industrial hygienist and building or facility manager.

3.2.5 Lead Paint Abatement

Lead abatement refers to construction activities undertaken specifically to remediate an imminent or potential hazard to humans or the environment from lead paint. This may include the removal, enclosure, or encapsulation of paint.

All lead abatement work involving less than 40-person hours that is performed by LLNL personnel or supplemental labor only employees must be described in a Lead Work Permit. An OSP may be required by the cognizant Industrial Hygienist for lead abatement work involving more than 40-person hours.

All subcontracted lead abatement work must be conducted by a contractor licensed by the California Department of Health Services and in accordance with the HUD "Guidelines for the evaluation and control of lead based paint hazards in housing."[1]

All indoor lead abatement areas will be subjected to a final visual inspection and final surface sampling in accordance with the HUD Guidelines.[1]

3.3 Responsibilities

3.3.1 Hazards Control Department

The Hazards Control Department shall perform required air monitoring and notify supervisors of air sample results. In addition, the Department shall

- where possible, establish NEAs for consistent types of lead work;
- notify supervisors of the need for medical surveillance when sampling so indicates;
- assist in the design and implementation of engineering control systems;
- provide the necessary training, other than accredited training;
- provide exposure information to the Health Services Department;
- review lead work plans, OSPs, and Lead Work Permits to ensure they incorporate adequate controls;
- approve the type of respirator and other personal protective equipment used by employees involved in lead work;

- review applications for waivers to prohibit the use of leaded construction products;
- obtain samples to detect lead where work is conducted by Programmatic personnel;
- assist supervisors in identifying potential lead-disturbing activities; and
- perform surface swipe-testing as required.

3.3.2 Health Services Department

The Health Services Department shall

- perform required medical surveillance exams and blood tests;
- determine when employees must be removed from exposure because of abnormalities detected during medical surveillance and when they can return to doing that type of work;
- notify employees of any medical findings, as required;
- request the Hazards Control Department to perform a worksite evaluation for any employee found to have possible health effects because of occupational lead exposure; and
- determine if measured elevations in blood lead are occupational.

3.3.3 Plant Engineering

Plant Engineering shall ensure that personnel who disturb or use leaded products receive the required training. In addition, Plant Engineering shall

- test surfaces and material to determine if lead is present before beginning construction work that will disturb materials that may contain lead (e.g., paint, galvanized metal, caulking, flashing) or potentially result in airborne lead exposure;
- where required, develop Lead Work Permits or OSPs and have them reviewed and approved by the cognizant industrial hygienist;
- obtain the necessary equipment to conduct work on leaded materials;
- ensure that persons working on leaded products receive the required medical examinations and biological sampling;
- prohibit its personnel, supplemental labor personnel, and construction contractors from using construction products containing more than 0.06% lead (this does not apply to electrical solder);
- specify in construction contracts if and where lead will be disturbed; alternatively require that subcontractors determine the presence of lead before disturbing materials that may contain lead; and
- develop and maintain a “Bidding Specification” that implements the LLNL Lead Safety Program in construction, renovation, and demolition contracts where lead material may be encountered.

3.3.4 Procurement Department

The Procurement Department shall ensure that a clause requiring the use of protective measures, other than chelation therapy, is inserted into all procurement service contracts that may involve exposure to lead.

3.3.5 Supervisors

Supervisors shall identify all employees who may be potentially exposed to lead and request that the ES&H team performs an evaluation. They shall also

- schedule employees who are exposed above the action limit specified in this supplement for medical examinations;
- where required, ensure that surfaces or materials are tested for lead before beginning construction work;
- where required, initiate a Lead Work Permit or OSP and have the cognizant industrial hygienist review it;
- ensure that all available and specified engineering and administrative controls and personal protective equipment are used appropriately;
- ensure that persons potentially exposed to lead receive appropriate training; and
- provide an alternative workplace and job for those who are removed from work involving lead exposure by the Health Services Department.

3.3.6 Employees

All employees shall follow the requirements outlined in this supplement for work involving lead and appropriately use the equipment provided by their supervisors. In addition, any employee who is pregnant or actively trying to conceive a child shall notify the Health Services Department.

3.4 Training

3.4.1 OSHA-Required Training

Two OSHA regulations require training for personnel potentially exposed to lead: 29 CFR 1926.59, “Construction Industry Hazard Communication Standard,” and 29 CFR 1926.62, “Construction Lead Standard.” These regulations specify two levels of training.

Level 1: Lead awareness training shall be provided to all employees who perform construction work that generates lead aerosols at levels below the action level or to employees who perform the activities listed in the section entitled “Lead Work Permits” for which the exposure level has not been determined. This includes plumbers and electricians who use leaded solders and carpenters who disturb small amounts of lead paint. This training meets the requirements of 29 CFR 1926.59. Contact the cognizant ES&H team to arrange for training, as necessary.

Level 2: Lead worker training is required annually for employees who are exposed to lead at levels exceeding the action limit specified in this supplement and for those who are subject to exposure to lead compounds that cause skin irritation. The requirements for this training can be found in 29 CFR 1926.62(l).

Lead worker training is best obtained at an accredited provider. The State of California has an accreditation program that consists of specific training for lead workers and their supervisors. Accredited training is not mandatory for work conducted at LLNL but may be required in the future. (Future regulations established by the EPA or the State of California may require this training.) Alternatively, a custom class can be designed by the Hazards Control Department for lead workers.

3.4.2 Inspector Training

The State of California offers a course for lead inspectors. Employees who conduct surveys to determine the lead content in materials should complete this course, unless they are a Certified Industrial Hygienist or work directly under the supervision of a Certified Industrial Hygienist or trained inspector. Subcontractors that perform lead surveys must meet either the training or certification requirement.

Section IV. References

1. Department of Housing and Urban Development, *Guidelines for the evaluation and control of lead-based paint hazards in housing*, HUD (February 1995).
2. American Conference of Governmental Industrial Hygienists, *The Biological Exposure Index for Lead*, ACGIH, Cincinnati, OH (1995).

Appendix A

Terms and Definitions

action level	The Medical Surveillance Action Level is 30 $\mu g / m^3$. This is the level of airborne lead to which an employee is exposed that may trigger the need for testing of the blood for lead levels. Exposure above this level on a single day in a year will trigger blood testing for construction work; exposure must exceed this level for more than 30 days per year during general industry work to trigger blood testing.
certified industrial hygienist	An industrial hygienist certified by the American Board of Industrial Hygiene in the Comprehensive Practice of Industrial Hygiene.
construction industry work	All work involving lead other than general industry work or chemical laboratory research. This includes all building and building-related equipment maintenance and repair activities, demolition, remodeling, or new construction.
general industry work	All work involving lead other than construction activities or chemical laboratory research. This includes work such as moving lead shielding bricks; using lead solder in electronics assembly shops; and machining leaded alloys in machine shops.
lead alloys	Metals made up of a mixture of metallic elements. For example, brass consists mostly of copper, but it usually contains 2–10% of lead as well.
lead compounds	Chemical compounds that include lead. These may be inorganic (e.g., lead oxide) or organic (e.g., tetramethyllead).
lead-containing material	Any material with any lead content. Certain limited exemptions apply for materials containing less than 0.06% lead.

lead soap	A lead salt of a long chain, naturally occurring carboxylic acid.
lead work area	Any area where lead-containing materials are disturbed such that exposure to airborne lead above 30 $\mu g / m^3$ may occur. Also, any area where a lead-disturbing activity occurs, other than minuscule lead work, for which there is no NEA.
minuscule lead work	Work involving lead that is not likely to result in exposure approaching the action level or permissible exposure limit. This includes handling fewer than 25 lead bricks (general industry) and drilling up to 12 holes less than 1/2 in. into lead-painted surfaces (construction work).

Appendix B

Medical Surveillance Requirements

Table B-1 and Fig. B-1 in this appendix list requirements and procedures for biological monitoring and medical surveillance.

Table B-1. Biological monitoring and medical surveillance requirements.

Blood lead level (μg/dl)	Frequency of retest	Physical exam	Administrative action
Less than 30	**Perform the test every 6 months as long as the employee continues to work with lead and is exposed 30 days or more per year. If the exposure is less than 30 days per year, retest every year.**	**Repeat exam is not required. (Refer to Fig. B-1 to determine whether an initial exam is required.)**	**None**
30–39.9	**Repeat the test within 60 days, then every 6 months.**	**Do a comprehensive physical if none has been done within the last 12 months and if the clinician determines that the elevated blood lead level is work related.**	**1. Interview the employee to determine if there is a non-occupational exposure. 2. Notify Hazards Control and request a worksite evaluation.**
40–49.9	**Test every 2 months until two consecutive tests show that the level is less than 40 μg/dl.**	**Do a comprehensive physical if none has been done within the last 12 months.**	**1. Notify the employee in writing within 5 days about test results and the possible consequences. 2. Notify Hazards Control and request a worksite evaluation.**
Greater than or equal to 50	**Repeat the test in 2 weeks, then perform the test every month until 2 consecutive tests show that the level is less than 40 μg/dl.**	**Do a comprehensive physical if none has been done within the last 12 months.**	**1. Remove the employee from work. 2. Notify the employee in writing within 5 days about test results. 3. Notify Hazards Control and request a worksite evaluation. 4. Do not have the employee return to work until two consecutive tests indicate that the level is less than 40 μg/dl.**

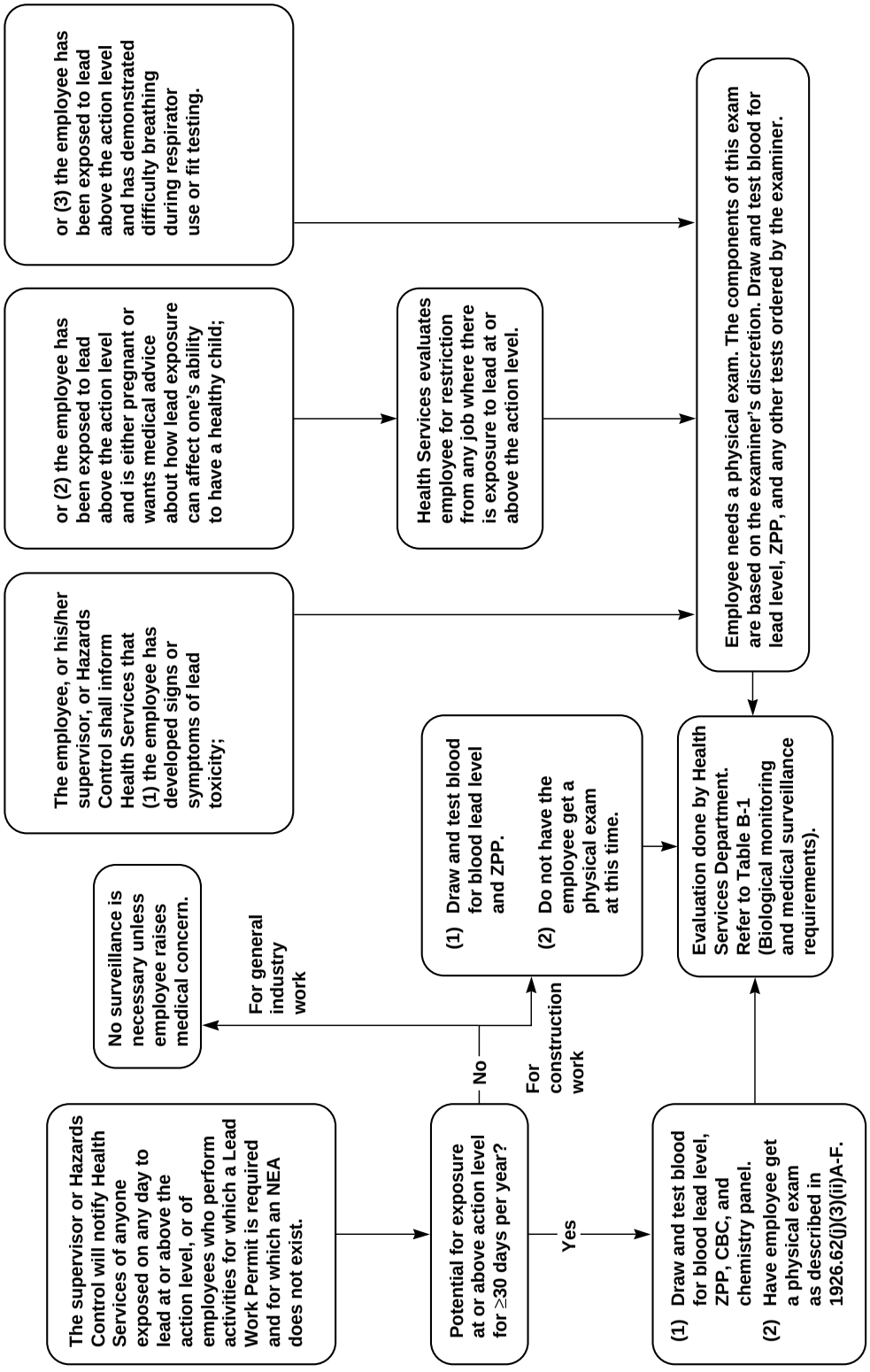

Figure B-1. Medical surveillance process.

Appendix C

Example of Lead Work Permit

GENERAL INFORMATION

Building _____ **Room/Area** _____ **Subarea** _____

Leaded material _____ **Concentration** _____ **Condition** _____

Area to be reoccupied _____ **Clearance sample by** _____

General work description _____

Lead/aerosol-generating operations _____

Expected duration _____ **Dates** _____

ENGINEERING CONTROLS

Local exhaust	_____	**General ventilation**	_____
Wetting	_____	**HEPA vacuum**	_____
Enclosure	_____	**Drop sheets**	_____
Critical barriers	_____	**Glove bag**	_____

OTHER ENGINEERING CONTROLS _____

OTHER TECHNOLOGY CONSIDERED _____

PERSONAL PROTECTIVE EQUIPMENT

Respirator (design) _____

Coveralls	_____	**Shoe covers**	_____
Gloves	_____	**Safety shoes**	_____
Safety glasses	_____	**Hard hats**	_____

OTHER _____

LEAD WORK PROCEDURES _____

_____

_____

HYGIENIC CONTROLS

Change area _____ **Shower facility** _____ **Hand-wash facility** _____

WORKER TRAINING

Name	ID No.	TrainingNotes	Expiration	
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Supervisor's signature _____ **Date**_____

Industrial hygienist _ **Date**___

This Lead Work Permit is only good for the work described. Any change in scope, procedures, or personnel requires re-approval of the permit. If necessary, attach the names of additional workers on a separate piece of paper (see Supplement 21.20 of the *Health & Safety Manual* for further details). Keep a copy of the permit at the job site. The industrial hygienist and the building manager should also keep a copy.